

Research Report



Dr. Buncha Ooraikul: "We would like to produce a similar but unique product."

New sauce in old bottles

Scientist substitutes canola for soybeans

The creation of a quality soy sauce is no simple matter. The fermentation process that gives a good sauce its high degree of flavour and aroma can take anywhere from six months to a year. And that is the major reason why some American brands sell for about \$4.59 a litre in Canada, and some of the better Japanese varieties fetch over \$5 a litre.

Dr. Buncha Ooraikul, a professor in the department of food science at the University of Alberta, became aware of the relatively high cost of the tasty dark sauce about eight years ago during some wild fluctuations in the price of the soybeans. He set about developing an inexpensive alternative, and with the help of a grant from Alberta Agriculture's Farming for the Future program, he is on the verge of success.

"What we are doing," says Dr. Ooraikul, "is making soy sauce using canola meal rather than the soybean. We have produced a sauce that has been tested by a Japanese chef in a popular restaurant in downtown Edmonton, and it received an 80% rating relative to other soy sauce products."


The 80% result, estimates Dr. Ooraikul, was achieved at the remarkably low cost of about thirty cents a litre. His advantage is a special recycling process using bioreactors which accelerates the fermentation process, cutting it to less than a month, and perhaps as short as one week. "We have done it on a lab scale so far, with good results," he says. "We haven't produced the final product yet. We're still fine tuning. We think we can get a better quality."

Canola sauce is remarkably similar in taste and odor to soy sauce, but not exactly the same. Nor does Dr. Ooraikul think it should be. "We would like to produce a similar but unique product," he says. "One that has special characteristics of its own that might make it even better than soy sauce."

One advantage canola sauce has over the soy variety is that some people develop allergic reactions to soybeans, limiting the product's market. What's more, soy sauce has a salt concentration of 18% to 20%. Dr. Ooraikul hopes to produce a sauce with a salt concentration in the range of 10% to 12%,

which will hold greater appeal to the health-conscious or to people on low-sodium diets. The canola sauce also has potential as a base for other popular sauces, such as barbeque, teriyaki and bul-go-gi.

Canola can be used to make a soy-sauce substitute because the proteins in soybeans and canola meal are quite similar. Canola's uses for human consumption are otherwise limited by its dark colour and fibre content, but neither is a factor in Dr. Ooraikul's work. Rather, the colour is an advantage, and the fibre content is of no consequence to the production of a sauce. "So this is a natural use for canola meal," he says.

The Alberta canola industry has already shown interest in Dr. Ooraikul's new product, and one particularly large firm may adopt his technology if it proves commercially viable. About \$10 million a year is currently spent on soy sauce in Canada alone. If an inexpensive alternative can be produced, the domestic and export potential is huge. 

This little piggy went to market

Finding a pre-test for PSE pork

A pig is a pig is a pig, unless you're talking to Dr. Allan P. Sather, a research scientist at Agriculture Canada's Lacombe Research Station. He estimates that about 20% of all pigs produced in Canada are PSE, i.e., prone to producing pale, soft, exudative (watery) pork, which has poor curing properties, a shorter shelf life and less aesthetic appeal than higher quality pork.

A PSE pig looks like a perfectly normal, healthy pig until it's subjected to stress. For genetic or environmental reasons, it is physiologically less capable of dealing with the strain, and that reaction affects its meat. "There is nothing wrong with PSE pork from a nutritional or health point of view," explains Dr. Sather. "But paleness is a serious problem in export markets, especially the Pacific Rim. They like a darker, redder meat." He estimates losses due to PSE pork at \$20 million annually for Canadian producers and processors.

Backed by a grant from Alberta Agriculture's Farming for the Future program, Dr. Sather, who received his Ph.D. in

animal breeding from Ohio State University, set out to develop a way of detecting animals likely to produce PSE meat. Currently, there is no reliable pre-slaughter test a producer or processor can apply to determine which pigs will be troublesome. A good screening test would greatly assist producers in eliminating those animals from their breeding stock says

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Dr. Sather. And it would also allow for the development of better management techniques for dealing with pigs which produce

PSE pork because of environmental factors.

Previous studies had indicated to Dr. Sather that one of the causes of PSE pork was an elevation in a pig's body temperature before slaughter. He began researching the potential of infrared thermography for detecting animals likely to produce this less desirable meat. Working with herds at the Lacombe research station, he used an infrared camera to measure temperature changes in pigs under a variety of conditions. He examined the animals' thermographic images to see if metabolic differences could be found between those pigs that produce good meat, and those that don't.

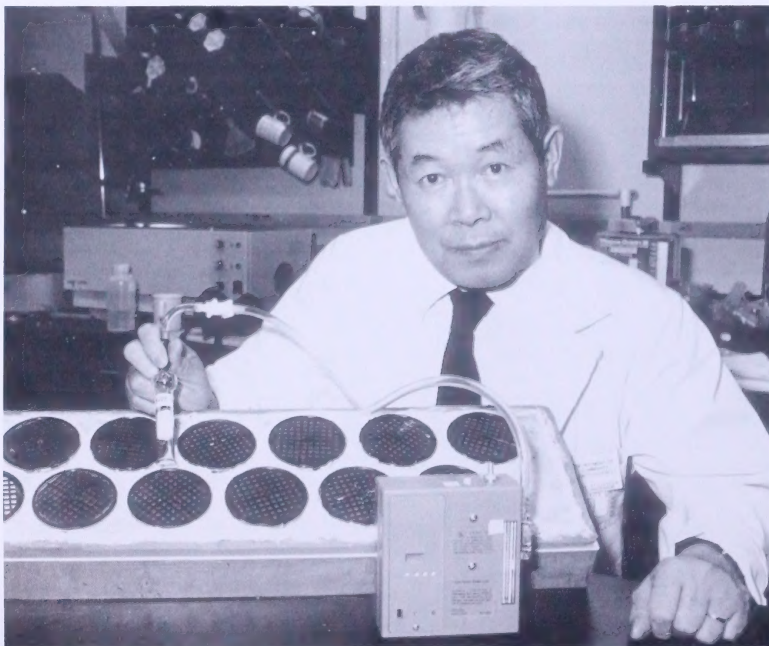
What he learned is that infrared thermography is not a sufficient test. It is a slight disappointment, acknowledges Dr. Sather, but he is buoyed by the fact that his research has narrowed the search for a good test. "The finding of a detection technique will have a great impact on the pork industry," he says. "So every step that takes us closer to that goal is important."



Researcher D

A breath of fresh air

Charcoal filters for carbofuran sprays



University of Calgary's Dr. Ken Yoshida with his charcoal filter

Most farmers appreciate the need to wear a gas mask while applying carbofuran sprays. Failure to do so can lead to headaches, dizziness and fatigue, and after a long day in the field a farmer can suffer loss of judgement and effectiveness. The end result could be a serious or even fatal accident. But most farmers also know a gas mask is an uncomfortable piece of equipment, and that it can seriously limit visibility and maneuverability. That's where Dr. Ken Yoshida steps in.

"The farmers would tell me they didn't want to drive around all day with a mask on," says Dr. Yoshida. "They wanted to know if there was some way the air in the entire cab could be cleaned." With the help of a grant from Alberta Agriculture's Farming for the Future program, he set out to help them.

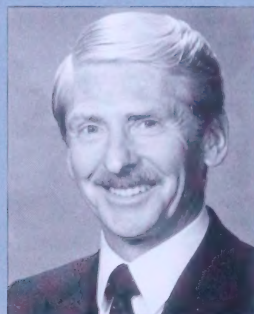
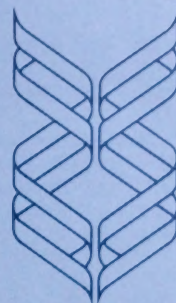
As associate professor of community health sciences at the University of Calgary, Dr. Yoshida became interested in the possibilities of using the tractor cab as a protective device during pesticide application while working at the University of Saskatchewan from 1978 - 84. He knew from previous research that the ordinary dust filter used in a cab's air-filtration system is not much use for stopping vapours and small spray droplets. To effectively protect a farmer from pesticides, he determined, a new system would have to be designed using activated charcoal filters.

Before building his prototype, Dr. Yoshida took measurements of levels of carbofurans inside and outside of vehicles spraying for grasshoppers in the Calgary area. He used a variety of vehicles under a variety of conditions to better represent a cross section of the district's population. He then designed and constructed the actual prototype, using interchangeable, commercially available carbon



Dr. Allan P. Sather and friend

FARMING FOR THE FUTURE



by **Ben McEwen**
Deputy Minister
Alberta Agriculture

As Farming for the Future embarks on another new year, I must re-emphasize the crucial importance of the agricultural research and demonstrations supported by this program. Since its formation in 1977, Farming for the Future has worked to fulfil its mandate by investing a total of over \$46 million in more than 1,000 agricultural research and on-farm demonstration projects conducted by Alberta's top private and public researchers.

Included in that funding is a \$5-million grant announced by the Honourable Peter Elzinga, Minister of Agriculture, for the current fiscal year. Of those monies, which are provided through the Alberta Heritage Savings Trust Fund, roughly \$4 million will be spent on 100 scientific research projects in a variety of areas. Among them:

- cereals and oilseed production;
- pest, disease, and weed control;
- forage crop production;
- irrigation water management;
- land resource management;
- swine and poultry production;
- food processing, economics and marketing;
- beef, dairy cattle and sheep production; and
- special crops production.

Another \$600,000 will be spent on more than 100 on-farm demonstration projects, and \$400,000 will be used for special projects, technology transfer, administration, and the publication of materials designed to keep Alberta producers abreast of the latest research developments. It has always been my contention that a successful producer is an informed producer.

I should mention that final project recommendations were made by the Farming for the Future Council, which I have the pleasure of chairing. I can certainly attest that deciding which research proposals should be funded this year was a most difficult task. So many of the proposals we receive are worthy of support.

As you may remember, two years ago, I discussed the concept of an Alberta Agricultural Research Institute (AARI) to coordinate and support the activities of agricultural researchers in government, industry and post-secondary institutions. Last year, the Honourable Peter Elzinga, Minister of Agriculture, introduced legislation to establish the Institute, and the Alberta Agricultural Research Institute Act was proclaimed on July 15, 1987. AARI now has a Board of Directors which has met several times and made considerable progress in mapping the Institute's future. I also appointed Dr. Ralph Christian as Executive Director of the Research Division, in 1987, and gave him the job of overseeing both Farming for the Future and the proposed AARI. I commend both him and the AARI Board for their work to date.

I am also delighted to note that the Farming for the Future Conference held in Calgary on March 18, 1988, was among the most successful gatherings of this organization. One hundred fifty producers, processors and researchers met to discuss the latest agricultural developments. Essentially, the main message to emerge from the conference was that the agricultural industry in Alberta is healthy and is making progress. I know that by working together we — industry, AARI, Alberta Agriculture, the universities, Agriculture Canada and the Farming For the Future Council — can more than adequately deal with the challenges facing agriculture as we head into the 1990s.

cartridges. A series of 14 of the cartridges were connected via the manifold to the fresh air supply of the tractor's air conditioner. (Because the cabs of tractors are airtight, unlike cabs of pick-up trucks, he knew that no air would enter the cab but through the air conditioner). The cartridges he used could be easily disconnected after spray operations, and a lapse-time indicator mounted on the unit showed him when it was time to replace the cartridges.

Dr. Yoshida then took his prototype units to the field for testing. He measured cab pressurization, rate of air change, air flow patterns in the operator's breathing zone, and filter flow rate, all under typical spray conditions (sunny days with little wind). The results, he says, were very good.

"The farmers would tell me they didn't want to drive around all day with a mask on."

The only drawback to his system is that many farmers find it necessary to leave the cab from time to time — perhaps to refill the sprayer, make a repair or to clear a path — and when they do so, they leave the cab door open. The clean air is subsequently lost. "But it's not a big problem," says Dr. Yoshida. "if the farmer keeps his mask on for 15 minutes and lets the system run, then the air will be clean."

He is now hoping that "the technology transfer people" will help him put his system into production. With any luck, he says, farmers in the not too distant future will be able to roll up their windows, turn on the air conditioners, and spray all day with their gas masks tucked away under the seat.

How much fertilizer?

New yield response equations for irrigated crops

Years of cultivation and cropping have deteriorated the level of organic matter in prairie soils. Consequently, farmers must fertilize their land in order to maximize their yields. But it is no easy task to determine the proper amounts of fertilizer to use; applying too much can be as unprofitable as not applying any at all. Last month, soil fertility specialist Ross McKenzie, on behalf of Alberta Agriculture's Farming for the Future program, announced that he and other provincial government researchers have devised a more accurate method of making fertilizer recommendations for irrigated crops in southern Alberta.

In devising the program, Mr. McKenzie and his colleagues conducted fertilizer trials on soils of varying nutrient levels at 76 different irrigated sites throughout southern Alberta from 1984 to 1987. They have prepared "reliable and up-to-date" fertilizer-response charts which relate soil test values to nitrogen fertilizer response. The charts, he says, can be used by soil testing labs, farmers and fertilizer dealers in determining how much fertilizer to use with specific crops in specific conditions, and how to apply it in the most efficient manner. The main goal, of course, is to help the producer achieve maximum economic yields.

"Existing fertilizer recommendations and yield response equations are outdated and require revision."

Mr. McKenzie, who has a B.Sc. in agriculture from the University of Alberta, says research in this particular branch of agronomy is sorely needed. Field experiments to correlate soil test levels with dryland crop response to fertilizer have not been conducted in southern or south-central Alberta for more than 15 years. Much of the information for making fertilizer recommendations for dryland crops is based on research conducted in the 1960s in the Lethbridge region by Agriculture Canada. In other areas such as Airdrie, Drumheller and Foremost, there has been almost no fertilizer research done for calibration with soil tests. Consequently, says Mr. McKenzie, "existing fertilizer recommendations and yield response equations are outdated and require revision. Use of new high-yielding grain varieties, new crops, reduced tillage, and the trend toward continuous cropping are additional factors that render current recommendations obsolete." The Farming for the Future Council has now approved funding in the current fiscal year for a project dealing with fertilizer recommendations for dryland crops.

Mr. McKenzie will be conducting fertilizer trials with a number of different crops in 15 major soil areas of southern and south-central Alberta.

Formerly an irrigation specialist with Alberta Agriculture, Mr. McKenzie says it is up to the fertilizer industry, government and university research agronomists to ensure extensive, local fertilizer research is conducted throughout the province on an annual basis. If this is done, fertilizer-response charts can be continually revised and updated for use by soil-testing labs, fertilizer dealers and producers. "A good farm manager uses only the fertilizer he needs," says Mr. McKenzie. "The bottom line is that fertilizer is a very

good investment, when used wisely."

Farming for the Future is currently funding another project to evaluate intensive crop management systems for wheat, barley and canola at four locations in Alberta. Two of the locations are in central Alberta and two in southern Alberta under irrigation. Mr. McKenzie, who is conducting the irrigated trials, is evaluating fertilizers, plant growth regulators, fungicides, herbicides, and stand density to determine their various effects on crops. However, he cautions that, "The degree and frequency of response to these inputs must be carefully determined before their cost effectiveness can be evaluated and recommendations made to Alberta farmers."



Ross McKenzie at the Lethbridge Agriculture Centre